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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

Lalit K. Mestha, et al.

Art Unit: 1734

Application No.: 10/000,379

Examiner: George R. Koch

Filed: October 31, 2001

Docket No.: A1097-US-NP
XERZ 2 00437

For: **MODEL BASED DETECTION AND COMPENSATION OF GLITCHES IN COLOR MEASUREMENT SYSTEMS**

MAIL STOP Appeal Brief - Patents
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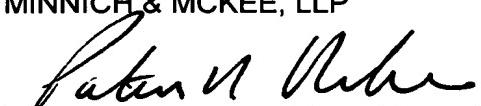
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Respectfully submitted,

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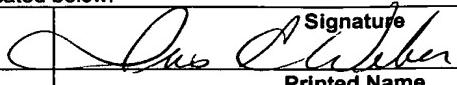
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PATENT APPLICATION



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BRIEF ON APPEAL UNDER 37 C.F.R. §41.37

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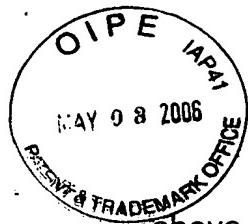
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Appeal from Group 1734

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This Appeal Brief is in furtherance to the Notice of Appeal regarding the above-referenced patent application that was mailed to the U.S. Patent and Trademark Office on February 15, 2006.

The fees required under 37 C.F.R. §1.17 and any required petition for extension of time for filing this brief and fees therefor are addressed in the accompanying transmittal of Appeal Brief.

Appellant files this Appeal Brief in connection with the above-identified application wherein claims 1-5 were finally rejected in the final Office Action mailed November 3, 2005, and wherein claims 6-19 were previously withdrawn.

I. REAL PARTY IN INTEREST (37 C.F.R. §41.37(c)(1)(i))

The real party in interest in this Appeal is the Assignee (Xerox Corporation,) Xerox Square - 20A, Rochester, New York 14644.

II. STATEMENT OF RELATED APPEALS AND INTERFERENCES (37 C.F.R.
§41.37(c)(1)(ii))

Currently, it is believed that there are no other appeals or interferences in process or pending before the U.S. Patent and Trademark Office which the present application bases its priority from, or any cases which base their priority upon the present application, that will directly affect, or will be directly affected by, or will have a bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS (37 C.F.R. §41.37(c)(1)(iii))

The status of the claims set forth in the Final Office Action mailed November 3, 2005 was, and is, as follows:

Claims 1-5 are rejected.

Claims 6-19 are withdrawn from consideration.

Claim 20 was refused entry.

The present appeal is directed specifically to claims 1-5.

IV. STATUS OF AMENDMENTS (37 C.F.R. §41.37(c)(1)(iv))

An Amendment (Amendment D) After Final Rejection proposing entry of new independent claim 20 including language similar to claim 1 but replacing the phrase -- color error value-- with the phrase "measured signal error value" was filed, subsequent to the final rejection, on December 5, 2005.

The Advisory Action mailed January 5, 2006, does not indicate whether or not Applicants' Amendment D was entered. However, in response to an inquiry, the Examiner indicated that Applicants' Amendment D **was not** entered.

In preparing the present Appeal Brief, it was noted that both FIG. 2 and the specification use the reference numeral --228-- to refer to two different portions of FIG. 2. An Amendment E correcting those errors by replacing the second instance of -- 228-- with "229" is being submitted herewith.

V. SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. §41.37(c)(1)(v))

The present application is directed toward systems and methods for detecting glitches or transient errors in color **measurement signals** and, when such glitches are detected, **temporarily replacing** the erroneous signal with a reasonable replacement signal (e.g., see claims 2 and 4) so that system stability can be maintained.

For example, independent claim 1 recites a method (e.g., 108, 208) of processing transient errors (e.g., 512) produced in a color measurement system (e.g., 324, 424), monitoring a color-producing process (e.g., 320, 420), the method comprising: implementing (e.g., 112, 228) a model of the color-producing process, monitoring (e.g., 114, 220) an input to the color-producing process, predicting (e.g., 118, 224) an expected color signal based on the model and the monitored input, measuring (e.g., 122, 232) an output color produced by the color-producing process to produce a measured color signal comparing (e.g., 126, 236) a measured 122, 232 color signal to an expected color signal to produce a color error value, and selectively (e.g., 126, 240 and/or 138, 252) replacing (e.g., 146, 260) the measured color signal based on the color error value.

Embodiments of the method are described beginning on page 4, line 26 — page 9, line 29.

Related systems are depicted in FIG. 3 and FIG. 4. Each system includes a best value selection algorithm (e.g., 336 or 436) which considers a difference (360, 460) between a signal (356, 456) from a color sensor and a predicted sensor signal (e.g., 352, 452) in order to make a determination as to whether the color signal (356, 456) from the sensor is reasonable or if the color signal includes a sensor glitch or transient error 512. If the color signal (356, 456) appears to include a glitch or transient error 512 (i.e., if the color signal is outside a reasonable range), an

assumption is made that the error occurred in the sensing system (324, 424) and not in the plant 320 or printer 420. Plants and printers are presumed to vary only slowly. Therefore, sudden and/or large changes in measurement values from expected values are deemed to be attributable to the color **measurement system** monitoring the color-producing process. Therefore, when the best value selection algorithms (336, 436) determine that the color sensor signal (356, 456) includes a glitch or transient 512, the best value selection algorithms (336, 436) replace the measured color signal with another value, such as a value from a model (328, 428). That is, the best value selection algorithms (336, 436) provide controllers (e.g., 316, 416) with the color sensor signal (356, 456) if the color sensor signal appears to be reasonable and provides the controllers (316, 416) with a substitute value if the value from the color sensor (324, 424) appears to be incorrect.

As described above and recited in, for example, dependent claim 2, replacing the measured color signal can include replacing the measured color signal with a predicted color signal. For example, as explained on page 6, lines 6-9 (see also page 6, lines 6-8; page 9, lines 21-22; page 13, lines 18-21), the replacement signal can be the predicted expected color signal or based thereon. Alternatively, a value derived from a historical database can be used. For example, during normal operation, when the sensor is determined to be working properly, measured color values may be stored 224 in association with the monitored (114, 220) input. Then, when a transient is detected, the measured color signal can be replaced with an historical color signal based on a stored 244 historical value related to the monitored input (page 6, lines 8-9; page 9, lines 22-23; page 13, lines 21-24) as recited in dependent claim 4.

As indicated, independent claim 5, implementing a model of the color production process can include selecting at least one of refined parameterized

Neugebauer model, a multi-dimensional numerical model and an on-line statistical parameterized model representative of the color-producing process. The use of these various models are discussed, for example, on page 7, lines 23-30.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37
C.F.R. §41.37(c)(1)(vi))

Whether claims 1-3 are anticipated under 35 U.S.C. §102(e) and/or §102(a) by U.S. Patent No. 6,222,648 to Wolf, et al. ("Wolf").

Whether claims 4 and 5 are unpatentable under 35 U.S.C. §103(a) over Wolf in further view of Refiner of Printer Transformations Using Weighted Regression by Raja Balasubramanian and Martin S. Maltz ("Balasubramanian - 1996") (the second MPL IDS document) and U.S. Patent No. 5,612, 902 to Stokes.

VII. ARGUMENT (37 C.F.R. §41.37(c)(1)(vii))

In stark contrast, it is respectfully submitted that the cited references are unrelated to measurement error detection or temporary replacing a measured signal with a reasonable substitute. Instead, the primary reference of the Office Action to Wolf discloses a method and apparatus for periodically upgrading the calibration of a printer or other display device. Wolf includes some discussion of a color sensor (densitometer/spectrophotometer 70). However, Wolf does not disclose or suggest that the densitometer/spectrophotometer 70 might produce transient errors or that the signal from the densitometer/spectrophotometer 70 is analyzed in order to determine if it includes a glitch or transient error. Moreover, Wolf does not disclose or suggest that the signal from densitometer/spectrophotometer 70 is replaced under any circumstances.

Wolf provides a method and apparatus for periodically updating the color calibration of an electrophotographic printer (or other digital output device) using a color transform lookup table stored in memory. Initially, a large number of color patch samples are printed, measured and stored as a map in what is referred to by Wolf as the high density compensator (i.e., MAPP 1). At intervals during the use of the printer, a small subset of the color patch samples are printed, measured and stored as a map in what is referred to as the low density compensator (i.e., MAPP 2). The subset changes each time this process is invoked. **The low density compensator provides a correction for the high density compensator; together they provide color calibration and compensation for slow drift of the printer (column 6, lines 44-58).**

Wolf does not disclose or suggest that the MAPP 1 or the MAPP 2 provide a compensation for, or replacement signal for, a color sensor, densitometer/spectrophotometer 70 or a color measurement system of any kind.

For at least the foregoing reasons, claim 1, as well as claims 2-5, which depend therefrom, is not anticipated and is not obvious in light of Wolf, Balasubramanian -1996 and Stokes taken alone or in any combination.

In this regard, it is respectfully submitted that the assertions of the Office Action appear to be based on a misunderstanding of Wolf, a misunderstanding of the present application, or both. For example, while the present application is directed toward errors in a **measurement system** or sensor, the Office Action makes reference to portions of Wolf that discuss drifts in calibrations associated with a printer **50**. While FIG. 1 depicts a signal from the sensor 70 delivered to the MAPP 2, that signal is not processed by or replaced by the MAPP 2. Instead, the signal from the sensor is used to periodically update transformation equations or tables within the MAPP 2 (column 6, lines 3-15 and 27-33). During normal operation, the MAPP 2 receives color data from the document creator 10 (R_cG_cB_c) and transforms that color data into values associated with a device independent color space (L_c*A_c*B_c*) (column 6, lines 16-26). The signal from the densitometer/spectrophotometer 70 is not processed or replaced by the MAPP 2. The MAPP 2 does not detect glitches or transient errors in a **measurement system** or the sensor **70**. Instead, the MAPP 2 provides a compensation for drifts associated with the printer 50 (column 2, lines 1-11; column 5, lines 19-38).

The secondary references do not correct the deficiencies of Wolf.

Stokes allegedly discloses a method and system for automatic characterization of a color printer.

Balasubramanian - 1996 discloses refinement of printer transformations using weighted regression.

The Claims are not Anticipated

Claims 1-3 were rejected under 35 U.S.C. 102(e) and/or 102(a) as being anticipated by Wolf. However, claim 1 recites:

A method of processing transient errors produced in a color measurement system monitoring a color producing process, the method comprising:

implementing a model of the color producing process;
monitoring an input to the color producing process;
predicting an expected color signal based on the model and the monitored input;

measuring an output color produced by the color producing process to produce a measured color signal;

comparing the measured color signal to the expected color signal to produce a color error value, and;

selectively replacing the measured color signal based on the color error value.

It is respectfully submitted that Wolf does not disclose or suggest a method of processing transient errors produced in a color measurement system monitoring a color-producing process. Moreover, Wolf does not disclose or suggest comparing a measured signal to an expected color signal to produce a color error value or selectively replacing a measured color signal (e.g., with a predicted value from a model or a historical value recorded during earlier operations) based on the color error value.

In this regard, it is respectfully submitted that the assertions of the Office Action are inaccurate. For example, page 2 of the Office Action identifies the

outputs of MAPP 1 and MAPP 2 as predictions of expected colors. However, it is respectfully submitted that the outputs of MAPP 1 and MAPP 2 are not predictions of expected colors. Instead, they are translations, mappings or transformations or partial mappings or transformations of color data from a document creator **10** (column 3, lines 41-62) into color descriptions useful for image processing (**20**, **30**, **40**) tailored for the printer 50 (column 5, lines 60-61, and column 6, lines 3-5).

Even if one or more of the outputs of MAPP 1 and MAPP 2 is construed to be an expected color signal, Wolf does not disclose or suggest comparing a measured color signal (e.g., the signal from densitometer/spectrophotometer **70**) to either the output of MAPP 1 or the output of MAPP 2. In support of the assertion to the contrary, the Office Action directs the attention of the Applicants to MAPP 2 and appears to assert that MAPP 2 performs a comparison between the document signal (from the document creator **10**) and the measured signal (from the sensor **70**). However, as explained above, MAPP 2 does not compare the color data from the document creator **10** to the signal from the sensor **70**. Instead, MAPP 2 maps or transforms the color data ($R_cG_cB_c$) to a device independent color space ($L^*a^*b^*$ (see FIG. 1, column 5, line 60 – column 6, line 10)).

From time to time, the sensor **70** is used to update the MAPP 2. It is respectfully submitted that during calibration in the system of Wolf, the information from the sensor **70** is assumed to be correct. The sensor signal is used to update values in the MAPP 2. However, the signal itself is not replaced with a substitute signal (e.g., such as a signal from a model or a record of past performance). Indeed, in Wolf, the signal from the sensor **70** is not even tested (i.e., compared to an expected color signal) to determine if the signal from the sensor is reasonable (i.e., is associated with a reasonable color error value).

Additionally, as indicated above, the output of the MAPP 2 does not represent a difference or comparison between the data from the document creator **10** and the signal from the sensor **70**. Instead, the output of the MAPP 2 is a partial mapping or transformation of the data from the document creator to a color space used by the MAPP 1.

Wolf does not disclose or suggest selectively replacing the measured color signal based on the color error. In this regard, the Office Action makes some assertions with regard to the output of MAPP 1 being turned into a densitometer signal which is fed into MAPP 2. However, even if this assertion is correct, disclosure of a sensor measuring a color produced by the printer 50 based on an output from MAPP 1 does not disclose or suggest replacing (e.g., with a predicted value or historical value) that measurement based on an error or difference between that measurement and a predicted measurement.

For at least the foregoing reasons, the rejection of **claim 1**, as well as **claims 2-5**, which depend therefrom, is not anticipated and is not obvious in light of Wolf, Balasubramanian - 1996 and Stokes taken alone or in any combination.

Additionally, **claim 2** recites that selectively replacing the measured color signal comprises replacing the measured color signal with a predicted color signal based on the expected color signal (page 6, lines 6-9). Since Wolf does not disclose or suggest replacing the signal from the sensor **70**, Wolf cannot disclose or suggest replacing the measured color signal with a predicted color signal or a predicted color signal based on the expected color signal. In this regard, the Office Action directs the attention of the Applicants generally to all of column 4. A more precise citation or more specific explanation is respectfully requested. In any event, the Applicants have carefully reviewed column 4 and have found no disclosure or suggestion of

replacing the signal from the sensor 70 (i.e., a measured color signal) with a predicted color signal or any other signal based on an expected color signal or otherwise.

For at least the foregoing additional reasons, **claim 2** is not anticipated and is not obvious in light of Wolf, Balasubramanian - 1996 and Stokes taken alone or in any combination.

The Claims are Not Obvious

Claims 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wolf in view of Balasubramanian and Stokes. In explaining these rejections, the Office Action stipulates that "Wolf does not disclose the models used or historical data."

Claim 4 recites replacing the measured color signal with a historical color signal based on a historical value related to the monitored input. It is respectfully submitted that Wolf, Balasubramanian - 1996 and Stokes do not disclose or suggest replacing a measured color signal. Furthermore, it is respectfully submitted that Wolf, Balasubramanian and Stokes do not disclose or suggest replacing a measured color signal with a historical color signal. Moreover, Wolf, Balasubramanian and Stokes do not disclose or suggest replacing the measured color signal with a historical color signal based on a historical value related to a monitored input (page 6, lines 8-9; page 9, lines 22-23; page 13, lines 21-24).

For at least the foregoing additional reasons, **claim 4** is not anticipated and is not obvious in light of Wolf, Balasubramanian - 1996 and Stokes taken alone or in any combination.

Additionally, the Office Action does not suggest a motivation for combining the models of Balasubramanian - 1996 or Stokes with the subject matter of Wolf. Indeed, it is respectfully submitted that Wolf does not disclose or suggest the use of models to predict an expected color signal, comparing the expected color signal to a measured color signal or replacing a measured color signal with historical color signals or any other kind of signal. Therefore, the Office Action has not met the burden of establishing a case of *prima facie* obviousness.

Furthermore, it is respectfully submitted that any motivation to combine Balasubramanian -1996 and Stokes with the subject matter of Wolf can only have been found in the present application. Therefore, the rejection of **claims 4 and 5** is based on impermissible hindsight.

For at least the foregoing additional reasons, **claims 4 and 5** are not anticipated and are not obvious in light of Wolf, Balasubramanian - 1996 and Stokes taken alone or in any combination.

In view of the above, the Appellants respectfully submit that claims 1-5 are not anticipated and are not obvious in light of the cited references. Accordingly, it is respectfully requested that the Examiner's rejections be reversed.

Respectfully submitted,


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CLAIMS APPENDIX (37 C.F.R. §41.37(c)(1)(viii))

CLAIMS INVOLVED IN THE APPEAL:

1. (Original) A method of processing transient errors produced in a color measurement system monitoring a color producing process, the method comprising:

implementing a model of the color producing process;

monitoring an input to the color producing process;

predicting an expected color signal based on the model and the monitored input;

measuring an output color produced by the color producing process to produce a measured color signal;

comparing the measured color signal to the expected color signal to produce a color error value, and;

selectively replacing the measured color signal based on the color error value.

2. (Original) The method of processing transient errors of claim 1 wherein selectively replacing the measured color signal comprises:

replacing the measured color signal with a predicted color signal based on the expected color signal.

3. (Original) The method of processing transient errors of claim 1 further comprising:

storing a measured color value representative of the measured color signal in association with the monitored input.

4. (Original) The method of processing transient errors of claim 1 wherein selectively replacing the measured color signal comprises:

replacing the measured color signal with an historical color signal based on an historical value related to the monitored input.

5. (Original) The method of processing transient errors of claim 1 wherein implementing a model of the color production process comprises:

selecting at least one of a refined parameterized Neugebauer model, a multidimensional numerical model and an on-line statistical parameterized model representative of the color producing process.

6. (Withdrawn) A method for calibrating a color reproduction device, the method comprising:

producing an image with the reproduction device in response to an input signal requesting the production of a target color;

measuring with a sensor, a color of the produced image, to generate a measured color signal value;

calculating an estimated color signal value based on the input signal;

validating the measured color signal value by comparing it to the estimated color signal value;

selecting a preferred color signal value from among at least the measured color signal value, and the estimated color signal value , based on the validity of the measured color signal value;

determining an error between the preferred color signal value and the target color; and,

selectively adjusting parameters of a control system of the color reproduction device to minimize the determined error for subsequently produced images.

7. (Withdrawn) The method for calibrating a color reproduction device of claim 6 wherein calculating an estimated color signal value comprises:

using one of a Neugebauer model, a multidimensional numerical model and a regression of historical performance data of the color reproduction device, in conjunction with an input valued based on the input signal to generate the estimated color signal value.

8. (Withdrawn) The method for calibrating a color reproduction device of claim 6 wherein validating the measured color signal value comprises:

determining a deltaE value between the measured color signal value and the estimated color signal value;

comparing the magnitude of the determined deltaE value with a predetermined threshold deltaE value; and,

generating a validity assessment of the measured color signal value based on the comparison.

9. (Withdrawn) The method for calibrating a color reproduction device of claim 6 wherein selectively adjusting parameters of a control system comprises:

selectively adjusting at least one tone reproduction curve.

10. (Withdrawn) The method for calibrating a color reproduction device of claim 1 wherein selecting a preferred color signal value from among at least the measured color signal value, and the estimated color signal value further comprises selecting a preferred color signal from among the measured color signal value, the estimated color signal value, and a value generated from historical system performance data.

11. (Withdrawn) A system including a color measurement sensor operative to monitor a color produced in a color producing process, the system comprising:

- a color producing process;
- a model of the color producing process, the model and the process operative to receive an input and respectively produce a model color signal and a process output;
- a color sensor operative to produce a measured color signal representative of the process output color;
- a preferred signal selector operative to select a preferred signal from among at least the model color signal, and the measured color signal; and,
- a signal consumer operative to receive the preferred signal from the preferred signal selector.

12. (Withdrawn) The system of claim 11 wherein the signal consumer comprises:

- a system controller operative to up date system control parameters based on the received preferred signal.

13. (Withdrawn) The system of claim 11 wherein the color producing process comprises:

a color printing process.

14. (Withdrawn) The system of claim 11 wherein the color producing process comprises:

a plant hydration process.

15. (Withdrawn) The system of claim 11 wherein the color producing process comprises:

a textile dying process.

16. (Withdrawn) The system of claim 11 wherein the color producing process comprises:

a food processing process.

17. (Withdrawn) The system of claim 13 further comprising:

a rendering device comprising at least one of a xerographic printer, an ionographic printer and an inkjet printer.

18. (Withdrawn) The system of claim 11 wherein the model of the color producing process comprises:

at least one of a refined parameterized Neugebauer model, a multidimensional numerical model and an on-line statistical parameterized model.

19. (Withdrawn) The system of claim 11 wherein the preferred signal selector is operative to select a preferred signal based on a difference between the measured color signal and a reference signal.

20. (Not Entered) A method of processing transient errors produced in a color measurement system monitoring a color producing process, the method comprising:

- implementing a model of the color producing process;
- monitoring an input to the color producing process;
- predicting an expected measured color signal based on the model and the monitored input;
- measuring an output color produced by the color producing process to produce a measured color signal;
- comparing the measured color signal to the expected measured color signal to produce a measured signal error value, and;
- selectively replacing the measured color signal based on the measured signal error value.